REMARKS

This Amendment is being filed responsive to the April 12, 2005 Office action that was issued in connection with the above-identified patent application. Prior to entry of the above amendments, claims 1-21, 23-29, 31-44 and 47-58 were pending and stand rejected. By the above amendments, claim 1 is amended, new claims 59-62 are added, and claims 4 and 47 are cancelled without prejudice. Reconsideration of the Office action is requested in view of the foregoing amendments and the following remarks.

In the Office action, claims 1-3, 5, 7, 9-10, 17, 21, 23-25, 27, 32-33, 37-39, 48-51 and 54-57 were rejected under 35 U.S.C. § 102(b) as being anticipated by Japan Publication No. 09-306531 to Toohata et al. ("Toohata"). The remaining claims were rejected under 35 U.S.C. § 103(a) as being obvious over Toohata alone or in combination with other references. Specifically, claims 6, 8, 26, 28, and 31 were rejected as being obvious over Toohata. Claims 4 and 47 were rejected as being obvious over Toohata in view of U.S. Patent No. 5,900,031 to Bloomfield ("Bloomfield"). Claims 34-36 and 40-44 were rejected as being obvious over Toohata in view of U.S. Patent No. 6,522,955 to Colborn ("Colborn"). Claims 52 and 53 were rejected as being obvious over Toohata in view of U.S. Patent No. 6,666,961 to Skoczylas et al. ("Skoczylas"). Claim 18 was rejected as being obvious over Toohata in view of U.S. Patent Application Publication No. 2002/0041986 to Wojtowicz et al. ("Wojtowicz"). Claim 29 was rejected as being obvious over Toohata in view of U.S. Patent No. 6,686,078 to Jones ("Jones"). Claims 11-16, 19, and 20 were rejected as being obvious over Toohata in view of U.S. Patent No. 4,988,580 to Ohsaki et al. ("Ohsaki").

Applicants have studied the cited references in view of the pending claims and the reasons expressed in the Office action. Applicants respectfully disagree that the subject matter of all of the original claims was anticipated or rendered obvious by the cited references. However, Applicants have amended claim 1 to recite subject matter that is neither disclosed nor suggested in the cited references, individually or in any permitted combination thereof. In the following discussion, Applicants first discuss the amendment to independent claim 1, from which claims 2-3, 5-46, and 48-58 depend. Applicants then discuss a representative claim that depends from claim 1 to present illustrative additional reasons why this claim is believed to recite subject matter that is neither disclosed nor suggested in the cited references. Applicants then discuss new claims 59-62.

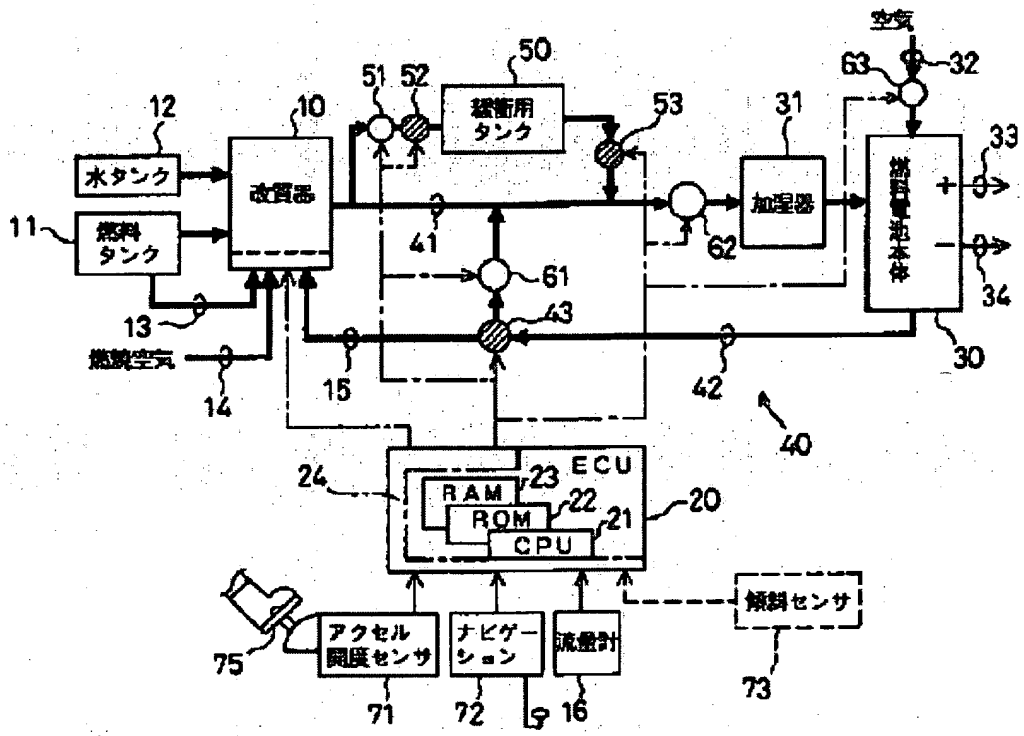
Amended Claim 1

Independent claim 1 has been amended to recite, amongst other subject matter, a fuel cell system with a hydrogen-producing fuel cell system that includes a hydrogen storage system that includes both an electrochemical compressor and a mechanical compressor that compress and store under pressure at least a portion of the product hydrogen stream from a fuel processor, and a fuel cell stack that is selectively adapted to simultaneously receive hydrogen gas that has been compressed by the compressors and hydrogen gas that has not been previously compressed by the compressors. As discussed in the present specification, a fuel cell system in which the fuel cell stack may selectively receive hydrogen gas from a fuel processor, from a hydrogen storage system, or both, enables a range of operating configurations that provides a more flexible, adaptable system. A potential benefit of the configuration recited in amended claim 1 is that the entire product hydrogen stream does not need to be compressed by the electrochemical

and mechanical compressors after being produced by the fuel processing assembly. Instead, some of the product hydrogen stream may be consumed by the fuel cell stack without having been compressed, while some of the product hydrogen stream may be compressed and stored in the hydrogen storage device. Another potential benefit is that an electrochemical compressor may provide highly pure, highly pressurized hydrogen for use during periods of increased energy demand.

Applicants agree with the Examiner that Toohata discloses a fuel cell system in which one or more fuel cell stacks receive hydrogen gas from a fuel processor, with the fuel cell system including a compressor that compresses a portion of the product hydrogen stream and a hydrogen storage device that stores some of the compressed hydrogen gas. However, Toohata does not disclose or suggest a fuel cell stack that is adapted to simultaneously receive hydrogen gas previously compressed by both electrochemical and mechanical compressors and hydrogen gas that has not been previously compressed by both electrochemical and mechanical compressors, as recited in amended claim 1. Instead, Toohata discloses only that a mechanical compressor compresses a portion of the product hydrogen stream, with some of the product gas stream being delivered to the fuel cell stack and some of the product gas stream being compressed and stored in a hydrogen storage device. The disclosure of Toohata is discussed below to point out this distinction, including the fact that the system of Toohata teaches away from the subject matter recited in amended claim 1 and would be rendered unsuitable for its intended purpose if modified to provide the recited configuration.

Toohata discloses a single configuration of a fuel cell system, which is reproduced below for the Examiner's convenience.



With reference to the Figure, the system of Toohata includes a fuel cell stack **30** that is supplied with hydrogen gas from a reformer **10** and a storage device in the form of a tank **50**. The storage tank is charged with compressed hydrogen gas that is produced by the reformer **10**. Some of the hydrogen gas produced by the reformer is compressed and stored in tank **50** and some of the product hydrogen gas is delivered to fuel cell stack **30**. The stored hydrogen gas in tank **50** is used to supplement the supply of hydrogen gas from reformer **10** to fuel cell stack **30** during periods of high energy demand. Further supplementation occurs via return line **42**, which provides recirculation of unreacted hydrogen gas **15** from the fuel cell. The system of Toohata is designed to be small, with an "easy configuration" (paragraph 0005) and providing a fuel cell system that "supplies

the drive energy of [] a vehicle" (paragraph 0009). Toohata expressly considers increased size (paragraph 0004) and increased heat production and complexity (paragraph 0005) to be problematic in an energy supply system designed for use in a vehicle. Increased size, heat production, and complexity might all be characteristics of the fuel cell system recited in amended claim 1. Accordingly, it follows that the system of Toohata does not disclose or suggest supplying hydrogen gas which has been compressed by electrochemical and mechanical compressors, and hydrogen gas which has not been compressed by those compressors, to the fuel cell stack, as discussed in more detail herein.

The Examiner argues that one of ordinary skill in the art would have been motivated to use the electrochemical compressor of Bloomfield in the system of Toohata. However, Toohata notes that its disclosed invention allows small systems to be developed by reducing the size of the storage tank (paragraph 0012) and the complexity of the overall system (paragraphs 0006 and 0007). The electrochemical compressor of Bloomfield, however, requires extra complexity and extra space, both for an external power supply (column 2, lines 47-50) and for a cooling system (column 4, lines 26-27; see also, Figure 2). Toohata teaches away from this extra complexity and size when it discusses supplementing the hydrogen demand of the fuel cell by reflux of unreacted hydrogen (paragraph 0024). Coupled with Toohata's disclosure that the fuel cell system is designed to provide hydrogen gas in a system of small size and low complexity, it follows that modifying the system of Toohata to increase complexity and increase size would be contrary to the specific requirements and disclosure of the reference. As such, Applicants submit that these contrary requirements of the cited references teach away

from the proposed combination thereof. For at least this reason, Applicants request reconsideration and withdrawal of the rejections based on the proposed combination of Toohata and Bloomfield.

For at least the above reasons, Applicants believe that a fuel cell system that selectively uses both electrochemical and mechanical compressors to compress and store at least a portion of the product hydrogen stream from a fuel processor patentably distinguishes Toohata. As such, and upon consideration of amended claim 1, Applicants request that the rejections of claim 1 be withdrawn.

Claims 2-3, 5-21, 23-29, 31-44, and 48-58 depend from claim 1 and therefore should be allowed when claim 1 is allowed. In view of the patentable distinction between amended claim 1 and the cited references, Applicants are not providing a detailed discussion of each of these dependent claims. However, Applicants want to briefly discuss a few of these dependent claims and to present illustrative additional reasons why these claims should be allowed.

Claim 54

Claim 54 depends from claim 1 and recites that the fuel cell stack is adapted to simultaneously receive a hydrogen gas stream from the fuel processor and a separate hydrogen gas stream from the hydrogen storage system. Applicants assert that Toohata does not disclose or suggest a fuel cell system with the operative configuration recited in amended claim 1 and further wherein the fuel cell stack is adapted to receive separate gas streams. In the Office action, claim 54 is rejected as being anticipated by Toohata. However, Applicants respectfully submit that Toohata does not disclose such a configuration of elements (see above Figure). For example, the Figure shows that the

fuel cell of Toohata contains only a single input stream passing through booster **62**. The single input stream of Toohata results from the coming together of at least three separate preliminary input streams: outbound line **41**, a stream of stored hydrogen from buffer tank **50**, and a stream of unreacted hydrogen from booster **61**. For at least this reason, Applicants submit that claim 54 should be allowed.

Claims 12-15 and new claims 59-62

Claims 12-15 and new claims 59-62 recite related subject matter and will be considered together for the purpose of brevity. New independent claim 59 presents previously pending claim 12 in independent form and recites, amongst other subject matter, a fuel cell system with a fuel processor that produces a product hydrogen stream in a separation region including at least one hydrogen-permeable membrane, a hydrogen storage system that includes a mechanical compressor that compresses and stores under pressure at least a portion of the product hydrogen stream, and a fuel cell stack that is selectively adapted to simultaneously receive hydrogen gas that has been compressed by the compressor and hydrogen gas that has not been previously compressed by the compressor, and to produce an electric current therefrom. Dependent claims 60 and 61 are analogous to dependent claims 13 and 14 and recite, respectively, that the separation region includes at least one hydrogen-selective metal membrane and that the metal membrane includes at least one of palladium and a palladium alloy. Independent claim 62 corresponds to previously presented dependent claim 15 rewritten in independent form, with the separation region being adapted to produce the product and byproduct streams through a pressure swing adsorption process.

Claims 12-15 stand rejected under 35 U.S.C.§ 103 as being obvious over Toohata in view of Bloomfield. Applicants agree with the Examiner that Toohata discloses a fuel cell system in which one or more fuel cell stacks receive hydrogen gas from a fuel processor, and that Toohata does not expressly teach that the system comprises a separation/purification region using a metal membrane or a pressure swing adsorption process. The Examiner asserts that Ohsaki discloses a hydrogen purification region that includes either a pressure swing adsorption system or a metal membrane, and that it would have been obvious to modify the system of Toohata to include such a purification region. However, Applicants respectfully submit that it would not have been obvious to incorporate the purification apparatus discussed in Ohsaki into the system of Toohata.

Applicants note that the fact that a claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish *prima facie* obviousness (see MPEP 2143.01). In the instant case, the issue involves whether it is obvious to one of ordinary skill in the art to incorporate a pressure swing adsorption or metal membrane purification region into a fuel cell system designed for and implemented in a vehicle, when consideration must be made of the size and complexity of the resulting system. In asserting that such an implementation is not *prima facie* obvious, Applicants note a discussion of this issue in U.S. Patent No. 6,106,963 to Nitta et al. ("Nitta").

Applicants have submitted a copy of the patent to Nitta and a statement of relevancy for previously submitted Japanese Unexamined Utility Model Application, First Publication No. H06-0827560 in a Supplemental Information Disclosure Statement which was filed on June 14, 2005. In a discussion of the relevant art, Nitta notes: "The large amount of zeolite or other adsorbent needed increases the size of the [pressure

swing adsorption] apparatus. [A] large amount of electric power is needed to drive the device for the [pressure swing adsorption] method. These drawbacks make the [pressure swing adsorption] method difficult to apply particularly in the case where the fuel cells of a fuel-cells system installed in an electric vehicle are used as a power source for driving the vehicle" (column 2, lines 15-22). Just such a scenario is present in Toohata, suggesting that the incorporation of pressure swing adsorption is not obvious in this case. Regarding the use of metal membranes, Nitta notes that "the size of the overall device increases in proportion to the area of the membrane and energy consumption rises in proportion to the pressure differential. The method using a membrane is therefore difficult to adopt for supply of ... gas to fuel cells for powering an electric vehicle" (column 2, lines 33-38). This is, again, just the scenario present in Toohata, and the suggestion, again, is that the incorporation of this purification apparatus into the system of Toohata would not be obvious to one of ordinary skill in the art.

For at least the above reasons, Applicants request reconsideration of the rejections of claims 12-15 and submit that it would not be obvious to modify the system of Toohata to include the purification region of Bloomfield. Accordingly, Applicants submit that claims 12-15 and new claims 59-62 recite allowable subject matter and should be allowable over the references of record.

With the entry of the above amendments, and for the reasons discussed herein, Applicants submit that all of the issues raised in the Office action have been addressed and overcome. If there are any remaining issues or if the Examiner has any questions, Applicants' undersigned attorney may be reached at the number listed below. Similarly, if the Examiner believes that a telephone interview may be productive in advancing

prosecution of the present application, the Examiner is invited to contact Applicants' undersigned attorney at the number listed below.

Respectfully submitted,

KOLISCH HARTWELL, P.C.

David S. D'Ascenzo
Registration No. 39,952
Customer No. 23581
Kolisch Hartwell, P.C.
520 S.W. Yamhill Street, Suite 200
Portland, Oregon 97204
Telephone: (503) 224-6655
Facsimile: (503) 295-6679